ABSTRACT

A method is disclosed for depositing a Black Diamond layer in a CVD chamber. Trimethylsilane, O_2, and Ar are flowed into the chamber at 300°C to 400°C with an O_2:Ar:trimethylsilane flow rate ratio that is preferably 1:1.5:6. The resulting low k dielectric layer is formed with a higher deposition rate than when Ar is omitted and has a k value of about 3 that increases only slightly in O_2 plasma. A higher density, hardness, and tensile strength are achieved in the Black Diamond layer when Ar is included in the deposition process. The addition of Ar in the deposition maintains film thickness uniformity below 2% for a longer period so that PM cleaning operations are less frequent and affords a lower fluorocarbon plasma etch rate to enable improved trench depth control in a damascene scheme. A lower leakage current and higher breakdown voltage in achieved in the resulting metal interconnect.